# Blockchain: Distributed Event-based Processing in a Data-Centric World

## FNU Vivek

Adapted from: Richard Hull (IBM Research), 21 June 2017 @ DEBS in Barcelona

# How do organizations collaborate in today's world?

- By exchanging documents
  - Trade finance: Letter of credit
  - Logistics: Purchase order, Tender
  - Mortgage, loan processing: scanned PDFs

- Are these simply messages exchanged between services?
  - No, because they persist, and are referred to, at later times
  - In fact, the documents refer to an implicit body of shared data

# Before Blockchain
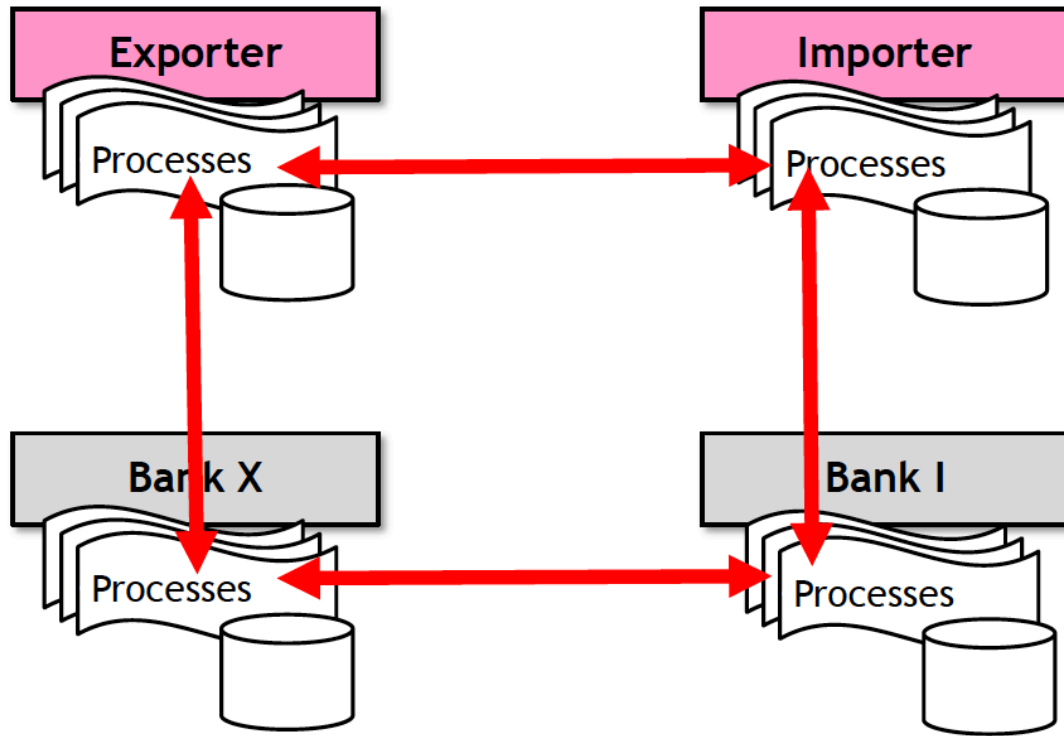


- Private copies of collaboration data
  - → Disputes can take month+ to resolve
- Private copies of collaboration processing logic
  - → Trust is based on binary relationships

# With Blockchain
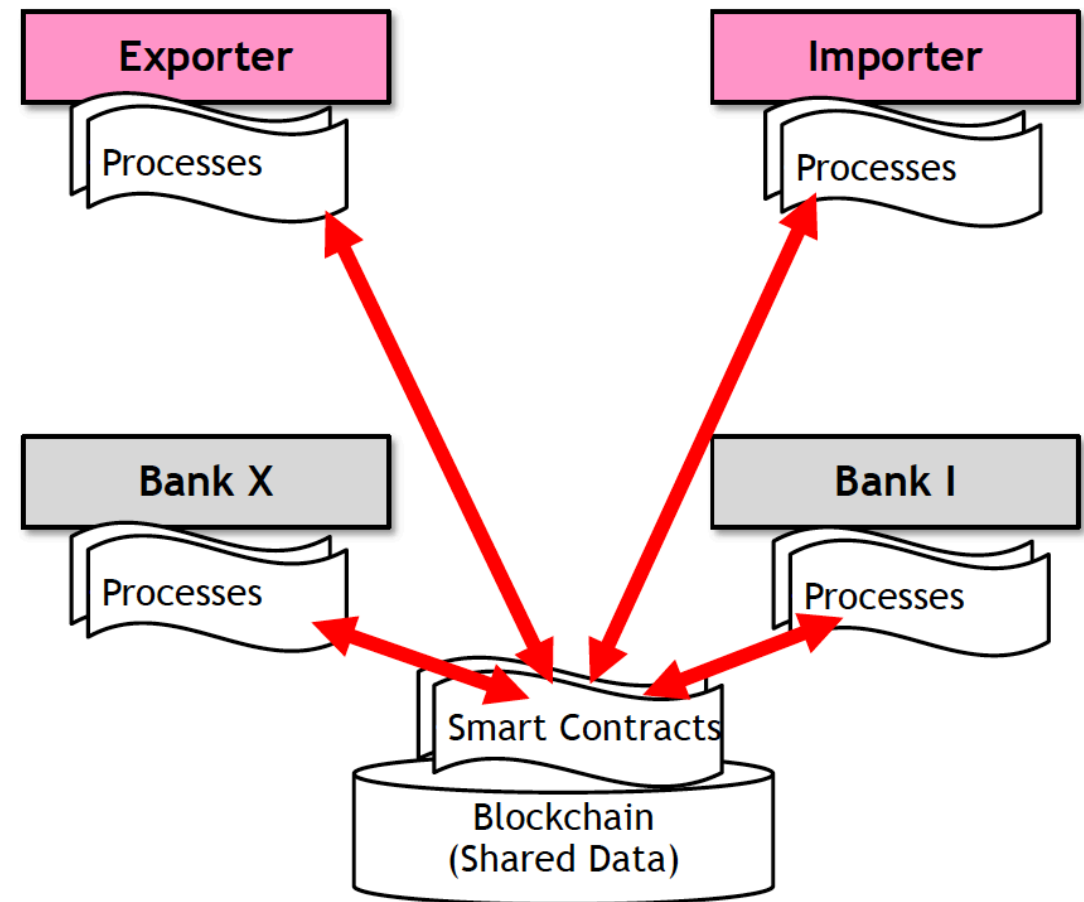


- Single shared copy of collaboration data
  - → Disputes can be resolved in a day
- Single shared copy of collaboration processing logic
  - → Trust becomes based on broadly visible shared data

# Blockchain is fundamentally a Distributed Event-based Processing Framework at 2 layers

- Foundational layer
  - Encryption
  - Consensus
  - Distributed copies of data
  - Event driven transition system

- Programming layer
  - Specification of logical behavior i.e. smart contracts
  - Event driven transition system

# What and How of Blockchain

- A blockchain provides:
  - High reliability
  - Shared single source of truth
  - Trusted
  - Selected privacy
  - Nonrepudiable data updates

- A blockchain consists in a network of servers
  - No trust between peers
- Supports ACID transactions
  - Consensus algorithm
- Supports selective privacy
  - Encryption technologies
  - Selective access to data and service calls

# Blockchain (for businesses) will dramatically streamline data/document sharing
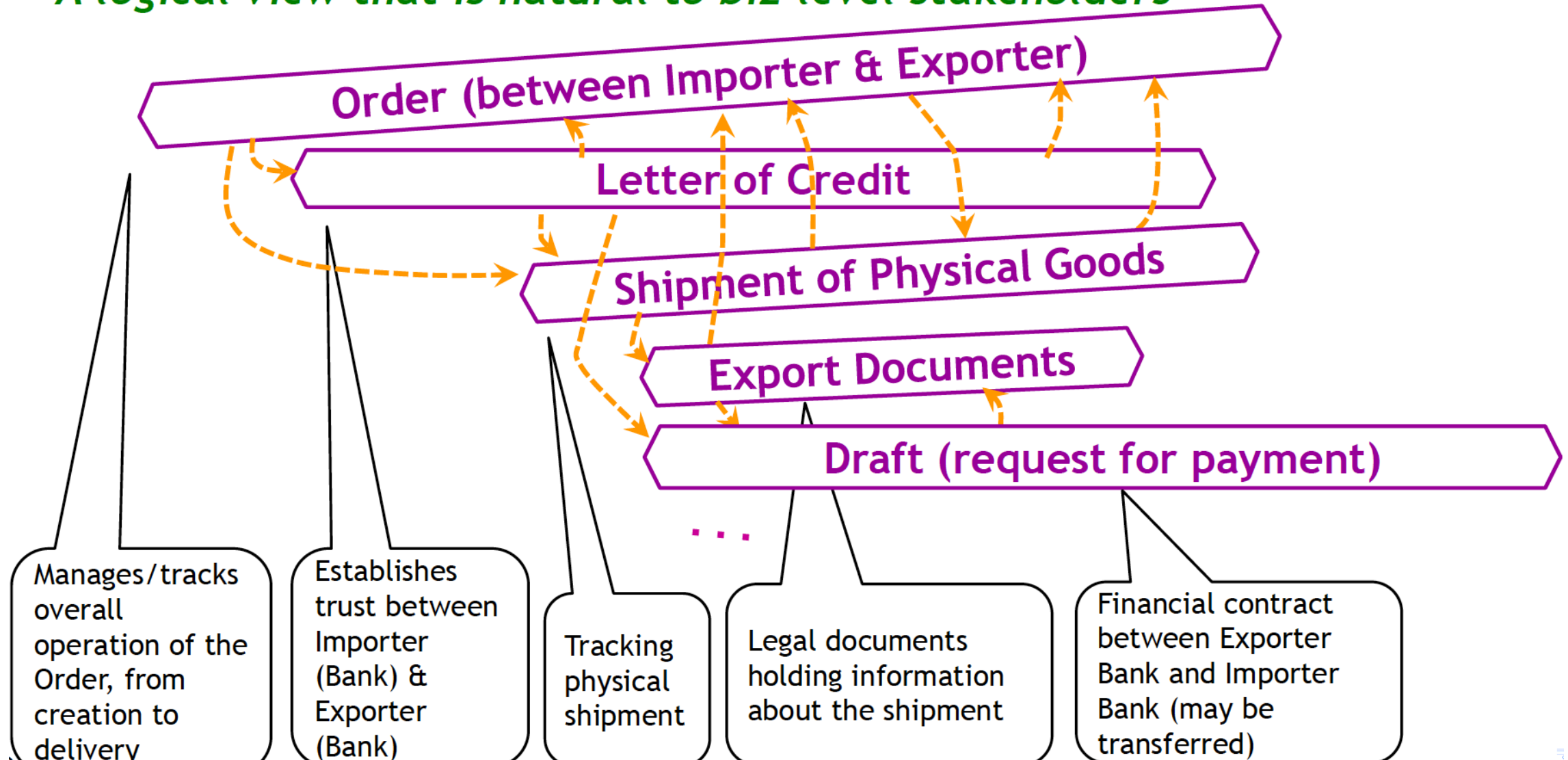
- Blockchain provides a trusted repository for holding persistent shared data.
  - Smart contracts help in business collaborations. Streamline logistics.
- Blockchain enables selective privacy
  - Each party can select what other party sees.
- Blockchain will enable deep business-level efficiencies
  - Streamlined data sharing
  - Dispute resolution
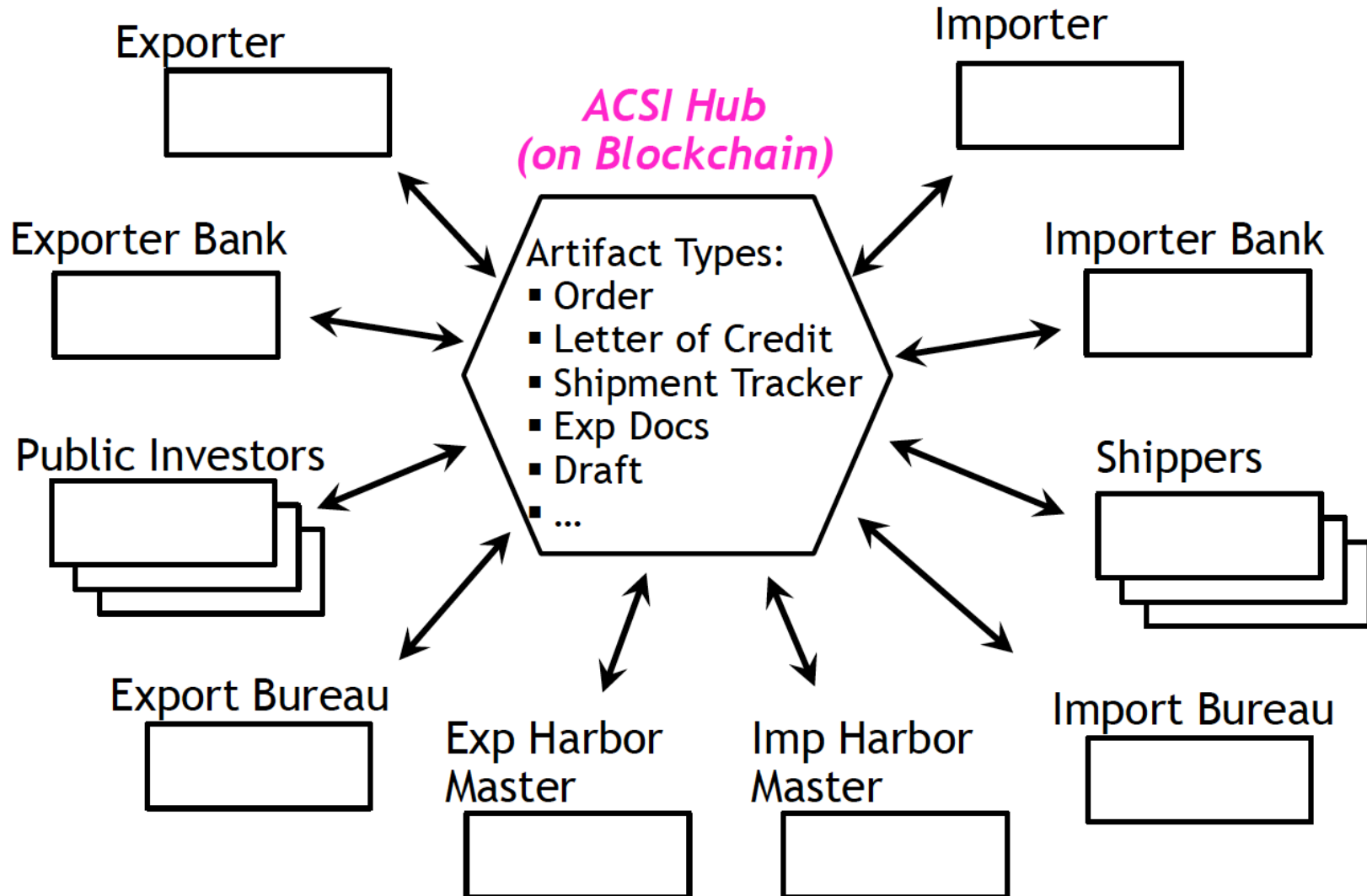
# Blockchain challenges for businesses

- Smart contracts may become ubiquitous. Business level SMEs will be involved in both creation and maintenance.

- Paradigm found in Business Artifacts and Business objects can provide modeling for Blockchain-based collaborations.

- Hyperledger Composer initiative makes abstractions of Business Artifacts available to smart contract developers.

- For smart contracts: Variation across time and application.
  - E.g. shipping – country policies, products, transport, finances, etc.
  - E.g. shipping – government regulations, tax rates, terms and conditions, etc.
  - Importance of strong modularity in design of languages and domains.

- Ensure correctness of smart contracts. Incorporate verification algorithms.

# Business Artifacts with Lifecycles: A way to factor Business Processes and their data that gives unifying, end-to-end view

*A logical view that is natural to biz-level stakeholders*

**Order (between Importer & Exporter)**

**Letter of Credit**

**Shipment of Physical Goods**

**Export Documents**

**Draft (request for payment)**

...

Manages/tracks overall operation of the Order, from creation to delivery

Establishes trust between Importer (Bank) & Exporter (Bank)

Tracking physical shipment

Legal documents holding information about the shipment

Financial contract between Exporter Bank and Importer Bank (may be transferred)

# Example ACSI Hub for Trade Finance

Exporter

Importer

**ACSI Hub**
**(on Blockchain)**

Exporter Bank

Importer Bank

Artifact Types:
- Order
- Letter of Credit
- Shipment Tracker
- Exp Docs
- Draft
- ...

Public Investors

Shippers

Export Bureau

Exp Harbor Master

Imp Harbor Master

Import Bureau

- The participating services do not have to be artifact-centric

ACSI: Artifact centric service interoperation

# Conclusion

- Blockchain based solutions will not live in isolation. Need to support business collaborations.

- Requires substantial extensions and revisions to the existing processes to ramp-up businesses on blockchain.

- Techniques are needed for automatically learning legacy processes and creating the connections to Blockchain smart contracts.

# Thank you!